

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PCT2109APsw	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/EP2004/007386	International filing date (day/month/year) 06/07/2004	(Earliest) Priority Date (day/month/year) 07/07/2003
Applicant AVALON PHOTONICS AG		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

A VCSEL HAVING IMPROVED TRANSVERSE MODE CONTROL BY OPTIMIZING THE INCREASED OXIDE APERTURE RELATIVE TO THE LASER DIMENSIONS

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regards to the drawings,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1a

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

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International application No.

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Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

The present invention provides a VCSEL device (100) and a method of fabricating the same, wherein two or more characteristic device dimensions (dm, dp) are correlated with each other so as to optimise single mode emission, while at the same time significantly providing an increased oxide aperture (dox) compared to conventional devices. Thus, device lifetime and reliability are enhanced. The present invention may rely on well-established process techniques for VCSEL devices having an oxide aperture (dox), wherein merely one additional mesa etch step is required.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/007386

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01S5/183

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 772 266 A (MOTOROLA INC) 7 May 1997 (1997-05-07)	1-14, 16, 19, 20, 23, 25, 26
Y	column 3, lines 16-59; figures 2, 3 column 4, line 50 - column 5, line 7 -----	4-8, 17, 18, 21-29
X	US 5 256 596 A (ACKLEY DONALD E ET AL) 26 October 1993 (1993-10-26) column 2, line 28 - column 4, line 12; figures 1, 2 ----- -/--	1, 9, 12, 13, 15-17, 19, 20, 23

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

1 October 2004

Date of mailing of the international search report

14/10/2004

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/007386

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>SHINADA S ET AL: "Micro-aperture surface emitting laser for near field optical data storage"</p> <p>LASERS AND ELECTRO-OPTICS, 1999.</p> <p>CLEO/PACIFIC RIM '99. THE PACIFIC RIM CONFERENCE ON SEOUL, SOUTH KOREA 30 AUG.-3 SEPT. 1999, PISCATAWAY, NJ, USA, IEEE, US, 30 August 1999 (1999-08-30), pages 618-619, XP010364559</p> <p>ISBN: 0-7803-5661-6</p> <p>the whole document</p> <p>-----</p>	17,18, 23,27-29
Y	<p>EP 1 276 188 A (AVALON PHOTONICS AG)</p> <p>15 January 2003 (2003-01-15)</p> <p>paragraphs '0020!, '0021!, '0033! - '0037!; figure 5</p> <p>-----</p>	21,22
Y	<p>NISHIYAMA N ET AL: "MULTI-OXIDE LAYER STRUCTURE FOR SINGLE-MODE OPERATION IN VERTICAL-CAVITY SURFACE-EMITTING LASERS"</p> <p>IEEE PHOTONICS TECHNOLOGY LETTERS, IEEE INC. NEW YORK, US,</p> <p>vol. 12, no. 6, June 2000 (2000-06), pages 606-609, XP000951817</p> <p>ISSN: 1041-1135</p> <p>the whole document</p> <p>-----</p>	23,27-29
Y	<p>US 6 529 541 B1 (NAKAYAMA HIDEO ET AL)</p> <p>4 March 2003 (2003-03-04)</p> <p>column 8, line 11 - column 12, line 27; figures 1-4,6-9</p> <p>column 14, line 14 - column 20, line 57</p> <p>-----</p>	4-8, 24-29

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/007386

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0772266	A	07-05-1997	EP 0772266 A1	07-05-1997
US 5256596	A	26-10-1993	JP 3306161 B2 JP 6045694 A	24-07-2002 18-02-1994
EP 1276188	A	15-01-2003	EP 1276188 A2 US 2002172247 A1	15-01-2003 21-11-2002
US 6529541	B1	04-03-2003	JP 2002208755 A	26-07-2002